

## **REMARKS**

### **Election/Restriction**

Rejoinder of the species by the Examiner is duly noted and appreciated.

### **Claim Amendments**

New claim 71 is duplicative of prior claim 66. Cancelled claim 66 was identified in the Reply of 10/19/2007 as “cancelled”; this was an inadvertent error. As claim 66 was subjected to examination in the Office Action of January 11, 2008, Applicants are reintroducing the subject matter as new claim 71 to eliminate potential future confusion.

Regarding paragraph 2 of the Office Action, Applicants have amended claim 28 to address the noted objection.

Regarding paragraph 3 of the Office Action, Applicants have reviewed the claim language in regards to recited ranges and the claims have been amended for clarity. Support for the amendments can be found as follows:

Multiolefin / conjugated diene content: paragraph [0082] / page 19, line 6;

Molecular weight: paragraph [00153]

Molecular weight distribution: paragraph [00184]; and

g<sup>vis.avg</sup>: paragraph [00202].

### **Double Patenting**

A. All pending claims (excluding claim 54 and withdrawn claim 70) were provisionally rejected over claims of copending Application No 10/538860 on the grounds of nonstatutory obviousness-type double patenting. Due to the issuance of on February 19, 2008 of 10/538860 as US Patent 7,332,554 (Shaffer I), it is presumed that this is no longer a provisional rejection.

Shaffer I recites an isobutylene-isoprene-isoprene triad distribution in a copolymer.

B. Claim 54 stands provisionally rejected over claim 10 of copending Application No 11/009660 (Shaffer II) on the grounds of nonstatutory obviousness-type double patenting.

Claim 10 of Shaffer II recites an isobutylene-isoprene-isoprene triad fraction in a halogenated copolymer.

Both rejections are premised on the theory of inherency as the polymers recited in the present application and those recited in Shaffer I and Shaffer II are produced by the same method, i.e. polymerization in a hydrofluorocarbon diluent. The burden of proof has been shifted to Applicants to show that the claims of both Shaffer I and Shaffer II do not inherently result in the recited polymers having substantially no long chain branching. Since these two rejections are substantially identical (claim 54 and Shaffer II are distinguished solely by the recitation of the polymerized copolymers being halogenated – and halogenation of the copolymer occurs subsequent to the disclosed polymerization step that occurs in the HFC diluent) Applicants have chosen to address them collectively.

Manufacturing a polymer in a given process will not inherently result in a polymer having both a particular triad distribution and a particular long chain branching structure. This is best understood by the following explanation provided by Applicants.

Polymerizations of the type disclosed and claimed by Shaffer I and Shaffer II are chain-growth polymerizations. Chain-growth polymerizations are characterized by the rapid addition of monomers to the active end of a growing polymer chain originally created by the addition of a catalyst/initiator system to a monomer solution. The kinetics of the polymerization are determined, in part, by the chemical structure of the chain end which is directly determined from the chemical identity of the incorporated monomer. When more than one monomer is used in a polymerization, i.e. a copolymerization, more than one type of growing polymer chain end may be present, the structural nature of which is determined by the comonomers employed. In the simplest case, the presence of two monomers, two different types of growing chain ends may be formed. Thus, four distinct kinetic events influence the sequence of comonomer addition to the growing polymer chain ends. The events are: the addition of monomer 1 or monomer 2 to a growing chain end resembling the structure derived from monomer 1 and the addition of monomer 1 or monomer 2 to a growing chain end resembling the structure derived from monomer 2. Stated another way, there are two different homopolymerization events (one for each comonomer) and two cross-polymerization events (one for each comonomer adding to the chemically dissimilar chain end) that influence the order of comonomer addition in the growing polymer chain. The balance of these four kinetic events determines the final comonomer sequence of the prepared copolymer. One way to characterize the comonomer sequence in the prepared copolymer is

to determine the triad fraction and its distribution. Other factors that influence the balance of the kinetic events and therefore the triad fraction in the prepared copolymer include temperature, choice of solvent or diluent, relative comonomer concentration, and to a lesser degree the catalyst.

While Applicants do not wish to be bound by any one theory, long chain branching in slurry polymerization is believed to occur after the initial polymer is formed predominantly by grafting of an active polymer chain onto the backbone of another polymer. The presence of a reactive group into the polymer backbone, i.e. an incorporated multiolefin monomer, is essential. Since polymers formed in slurry polymerization conditions readily precipitate from the polymerization medium, the physical condition of the polymer chains in the slurry particles has a strong bearing on the ability of long chain branching reaction to take place. When the slurry particles are swollen with diluent, sufficient mobility of the polymer chains exist for this grafting reaction to take place. If the particles are not sufficiently swollen, the polymer chains do not possess sufficient mobility and the reactions which would lead to long chain branching do not occur. Thus, long chain branching reactions are influenced by the physical conditions of the slurry particles and not the chemistries of comonomer reactivity which lead to different triad fractions.

Since the nature of the triad fraction (i.e. the value of "m" as recited in Shaffer I and Shaffer II) and the amount of long chain branching (i.e. the value of " $g_{vis,avg}$ " as recited herein) characterize different features of a polymer structure and are influenced by different phenomena, there is no basis for inferring that a single polymer will have both characteristics as recited in Shaffer I and Shaffer II and the present application. It is possible, for a polymerization in a particular diluent, under different conditions, such as temperature, slurry concentration, catalyst concentrations, to yield a polymer with a particular triad distribution, as recited in Shaffer I and Shaffer II, that is either substantially free of long chain branching or has a greater than zero measurable amount of long chain branching. Conversely, it is possible to produce a polymer with a triad distribution outside of the recited ranges of Shaffer I and Shaffer II that is substantially free of long chain branching.

For these reasons, the substantial absence of long chain branching in a copolymer, as recited in the present application, is not inherent in the copolymers of Shaffer I and Shaffer II.

It is requested that these rejections be reconsidered and withdrawn.

The Examiner is invited to telephone the undersigned attorney if there are any issues outstanding which have not been addressed to the Examiner's satisfaction or if there are other issues which the Examiner believes can be readily resolved via a telephone interview.

Respectfully submitted,

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Date

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